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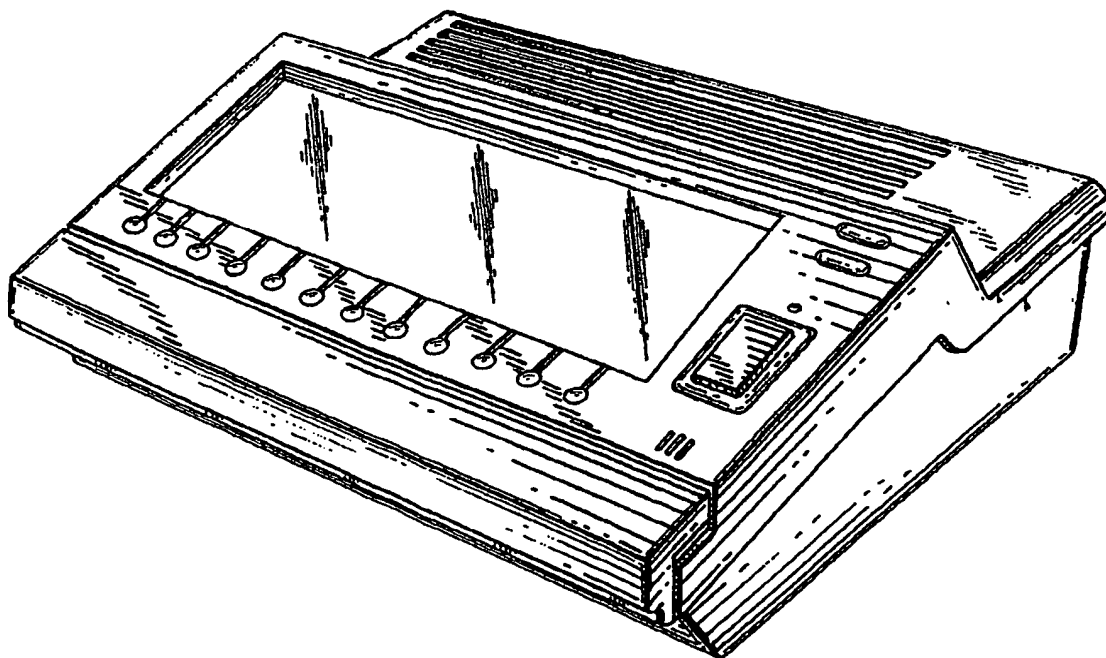
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(54) Title: **TELEPHONE ANSWERING AND VOICE MESSAGING MACHINE**

**(57) Abstract**

The FRIDAY personal office receptionist is a feature packed telephone answering machine which utilizes all digital components to effectively handle voice message reception operations. The apparatus utilizes a digital signal processing (DSP) micro controller to provide for recording of digital messages in a plurality of voice mailboxes, personal greetings, music on hold, and other advanced functions including call forwarding, remote notification of the reception of messages, and the capability to detect an incoming data transmission for routing calls to a facsimile or personal computer.

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TELEPHONE ANSWERING
AND VOICE MESSAGING MACHINE

SPECIFICATION

Background of the Invention

This invention relates to communication systems, and, more specifically, to the creation of an advanced digital answering system that performs all of the duties of a receptionist for small business owners, home office workers, and consumers.

The number of small businesses and home offices is growing at a rapid rate. Today, nearly 20 million small businesses operate in the United States. Also, according to BIS Strategic Decisions by the end of 1994, 24 million households will have income-producing home offices, and another 18 million households will have after-hours home offices.

FRIDAY is designed to meet the needs of these small business owners. Research indicates that home office workers and small business owners struggle with managing their communications

and with creating a professional image. In addition, they rely heavily on their telephone and answering devices to service customers. Larger competitors have been enhancing their businesses by investing in the latest communication technology. Due to the high cost of digital phone systems and voice mail systems (up to several thousand dollars), most small business owners and home office workers continue to rely on traditional communication devices such as telephones and cassette-based answering machines. As a result, one out of seven home businesses experiences a telephone product failure each year, according to Link Resources.

Bogen Communications, Inc. is providing a solution to the inadequacies of telephone answering devices currently on the market. With its advanced digital technology, FRIDAY addresses the telecommunication needs of small business owners and home office workers and provides its users with a variety of features not available in other answering devices.

SUMMARY OF THE INVENTION

The advantages claimed for FRIDAY, The Personal/Office Receptionist are as follows:

FRIDAY is a complete message management system. FRIDAY offers multiple mailboxes; the ability to selectively save and delete messages; to forward calls to any location; to share telephone lines with a fax machine or PC; and to professionally manage and reliably screen calls.

The system comes equipped with a total of eight voice mailboxes-- four personal voice mailboxes, three announcement-only

boxes, and one mailbox dedicated to a fax or PC. FRIDAY has 18 minutes of digital memory which is upgradable to 36 minutes with a memory module easily plugged in by its owner.

FRIDAY is not simply an answering machine. The system serves as an 'electronic receptionist' that handles calls rather than just takes messages. Upon the owner's request, FRIDAY answers the telephone; announces who is calling; lets calls through; provides for music-on-hold; or routes calls automatically to specific voice mailboxes. In addition, the unit can remind its owners of pending appointments. For each personal voice mailbox FRIDAY can forward calls instantly to any remote location; thus, allowing the small business owner on the move to remain constantly in touch anywhere and at any time with the office and with customers.

In addition, calls that have been picked up by a person in the office and are intended for another worker can be routed back to Friday, by simply pressing the 'Messages' button. This feature saves the need to take written messages for co-workers, and in case of incoming fax transmission does not necessitate another phone call by the caller: the caller is offered the main menu, and thus all of Friday's options become available to him.

FRIDAY has the capability to detect and route data transmission to a fax machine or PC. The built in voice-data switch allows all office communications equipment to coexist on only one or two telephone lines.

DESCRIPTION OF THE DRAWINGS

DETAILED DESCRIPTION

(Refer to the attached block diagram: those elements of the block diagram that are not mentioned by name of reference number are described in a separate section, "Description of major modules").

FRIDAY instantly forwards calls for any mailbox owners to any location instantly. This allows the owner to answer phone calls anywhere, at any time.

The telephone numbers for forwarding the incoming calls are programmed into the system using the Front Panel (9) unit. The numbers are stored by mailbox in the controller's (6) memory. The four personal voice mailboxes can be set to forward calls. The owner would press the first button from the left ("SELECT MAILBOX" with the cover on [the activation of the cover is performed by (9), and monitored by (6)]) and then follow the voice/display prompt to select his/her mailbox ([1] is for Mailbox 1, [2] is for Mailbox 2, [3] is for Mailbox 3, and [4] is for Mailbox 4)). The whole process of programming the unit and verifying the

effective setup is made possible by the audio and visual combination of the unit's LCD (8) and Front Panel activation unit (9), and the synthesized compressed voice prompting method. As such, upon pressing any push button of (9), the display will instantly reflect the required function that is being activated (controller (6) instructing the display controller (7) that drives (8)), and the voice processing controller (6) generating instruction phrases from the compressed words stored in (11), and played from the analog voice processing unit (13) through the speaker, after being routed via the switching matrix of (3).

After selecting the mailbox, the owner would press the seventh button from the left ("CALL FORWARD" with the cover on). The owner is given the option to turn the call forward on, or off, or to program a phone number which the unit will dial in the event a caller selects his/her mailbox. When the owner programs a phone number and activates call forward, FRIDAY is ready to perform the call forward feature.

The voice prompts are played by the units' DSP (digital signal processor), that combines the digitally stored and compressed words that reside in the unit's memory into sentences. The specific word combination are invoked as a result of the events that are detected by the Friday's controller: a button being pressed, activation of a dtmf (touch tone keypad of a phone being activated), or as a result of the internal logical progress of the control unit, that acts based on the stage the unit is at determines what is the next stage. The controller is in charge of

combining and displaying the relevant display icons on Friday's LCD. The display to the viewer is a combination of symbols, words, and digits, each of the above in any state of off, constantly on or blinking at various rates.

When a caller phones in and FRIDAY answers (the ring signal being detected by the Line Interface (1) module, and reported to the controller (6), the caller hears a factory-recorded (played by (6), with the voice compressed data being stored in (12)) main greeting or a customer-recorded (played by (6), with the voice compressed data being stored in (11)) main greeting that includes a choice of mailboxes. When the caller selects a mailbox (by pressing the corresponding number on a touch-tone phone) which is in the call forward mode, the caller is informed that he/she should hold while the call is being forwarded. The detection of the touch tone signals that are generated by the caller (external to the system) is being performed by hardware or software algorithms that are part of (13) and (6) and additional associated circuitry. The caller is also informed that in the event of a busy signal or no answer at the forwarded number, the caller can press the "star" key on their phone and be routed into the personal voice mailbox of the owner to leave a message. Then FRIDAY calls forward to the pre-designated phone number. The generation of the dialing signals required to initiate a phone session (DTMF) is performed by (6), implemented in software. A hardware method can be used to achieve same effect. When someone answers at the forwarded number, FRIDAY connects the two parties: the original caller and the forwarded

party.

For the one-line unit, FRIDAY requires three-way calling from the central office. FRIDAY hook-flashes (performed in (1) by interrupting the current supplied by the central office or by a PBX) to access the second line after the original caller calls in. When the forwarded party answers, FRIDAY hook-flashes again to connect the two parties. On the two-line version, FRIDAY uses the second line to call the forwarded party. The switching in this case is done at (3). Then the line which the original caller called in on is connected to the line on which the forwarded party was reached.

FRIDAY is capable of handling a different call forward number for each mailbox. The controller (6) and code memory (12) are responsible to manage the association of mailboxes and forwarding numbers. In other words, four mailbox owners could each have their mailboxes call forwarded to four different call forward locations.

FRIDAY instantly notifies any mailbox owners of urgent messages by calling their pager, cellular phone, or any other location they choose (ie. hotel room or second home). This feature insures that the small business worker is never unreachable or out of touch.

The four personal voice mailboxes can be set to inform mailbox owners of urgent messages to any location. For pager notification, the owner would press the first button from the left ("SELECT MAILBOX" with the cover on) and then follow the voice/display prompt to select his/her mailbox ([1] is for Mailbox

1, [2] is for Mailbox 2, [3] is for Mailbox 3, and [4] is for Mailbox 4)).

After selecting the mailbox, the owner would press the ninth button from the left ("PAGER NOTIFY" with the cover on). The owner is given the option to turn the pager notify feature on, or off, or to program a pager phone number which the unit will dial in the event of an urgent message (the owner should enter the phone number and DTMF string corresponding to the number which activates the owner's pager and informs the owner to call the FRIDAY). When the owner programs a phone number and activates remote notification, FRIDAY is ready to perform the pager notify feature.

When a caller phones in and FRIDAY answers, the caller hears a factory-recorded main greeting or a customer-recorded main greeting that includes a choice of mailboxes. On all calls that are being serviced directly by Friday, the call is maintained active by the Line Holding and Monitoring elements of (4). These, along with the Line interface (1) represent towards the calling party a regular telephone. By default, outgoing calls that have been originated by the local telephones and data terminals are switched directly to external lines and serviced by them without Friday's intervention.

When the caller selects a mailbox (by pressing the corresponding number on a touch-tone phone) which is in the remote notification mode, the caller is informed that the mailbox owner is not available and is prompted to indicate whether the call is urgent or not. By indicating that the message is urgent, the

caller is triggering remote notification. After the caller leaves a voice mail message, FRIDAY will call the mailbox owner at the pre-designated phone number which generates the page. The owner is paged and calls into the FRIDAY to check his/her messages.

FRIDAY is capable of handling a different pager notification number for each mailbox. In other words, four mailbox owners could each have their mailboxes pager notifying them of urgent messages to four different pager numbers.

The four personal voice mailboxes also can be set to inform mailbox owners of urgent messages to any regular location which has a telephone or cellular phone ("REMOTE NOTIFY"). For remote notification, the owner would press the first button from the left ("SELECT MAILBOX" with the cover on) and then follow the voice/display prompt to select his/her mailbox ([1] is for Mailbox 1, [2] is for Mailbox 2, [3] is for Mailbox 3, and [4] is for Mailbox 4)).

After selecting the mailbox, the owner would press the eighth button from the left ("REMOTE NOTIFY" with the cover on). The owner is given the option to turn the remote notify feature on, or off, or to program a phone number to dial in the event of an urgent message. When the owner programs a phone number and activates remote notification, FRIDAY is ready to perform the feature.

When a caller phones in and FRIDAY answers, the caller hears a factory-recorded main greeting or a customer-recorded main greeting that includes a choice of mailboxes. When the caller

selects a mailbox (by pressing the corresponding number on a touch-tone phone) which is in the remote notification mode, the caller is informed that the mailbox owner is not available and is prompted to indicate whether the call is urgent or not. By indicating that the message is urgent, the caller is triggering remote notification. After the caller leaves a voice mail message, FRIDAY will call the mailbox owner at the pre-designated phone number and play a factory-recorded message to input a security code to review the urgent message. Once the code is entered, FRIDAY plays the urgent message to the owner.

FRIDAY is capable of handling a different remote notification number for each mailbox. In other words, four mailbox owners could each have their mailboxes remotely notifying them of urgent messages to four different phone numbers.

FRIDAY has a call block feature to prevent toll fraud. Toll fraud has become a problem within the PBX/Key system environment. Telephone hackers call into a company with a PBX or Key system on a local call. Once they are in the system, they grab an outside line by tricking the system into believing that they are actually in the building. Once they get an outside line, they make international phone calls at the expense of the PBX/Key system owner.

FRIDAY has a feature which prevents toll fraud. This is the only feature which cannot be programmed remotely. It is only programmable at the unit. The owner can enter up to three area code prefixes -- each no more than four numbers -- which can be

blocked by the unit. When these prefixes are in the system, FRIDAY will block any call forward, remote notification, and pager notification attempts which begin with these prefixes. For instance, if an owner entered the prefix of "011," the FRIDAY would block any attempt to route calls or remotely notify or page internationally.

FRIDAY provides 18 minutes of solid-state digital messaging capacity to record messages. Messages left by callers and all greetings and messages recorded by the owners are digitally stored. The storage is accomplished in the Compressed Voice Memory (11), that stores in addition to the voice some operational parameters required by (6) to form phrases from the compressed data in memory.

FRIDAY has a plug-in memory expansion module (14) to double its capacity to 36 minutes. The plug-in module is a mini-PC board with memory chips and connectors. The module is plugged in by the owner. The owner slides the module on a guiding track in the back of the unit until the connectors lock onto the board in the FRIDAY. The unit recognizes that the module is in place and reconfigures itself to except twice as much digital information as before.

FRIDAY's auto receptionist answers calls with a factory recorded greeting or the owner's custom greeting, providing callers with a friendly, professional reception. The system offers music-hold-on capabilities and caller announce screening. Music on hold is provided by an external music source that is routed into Friday

through the analog voice processing unit (13), into switching matrix (3) and then to the destination (the line that is put on hold at the time).

FRIDAY has a mini-jack audio input on the back of the unit and a POT on the back of the unit to control the volume of the audio input. The owner can connect an audio source to the FRIDAY. When the owner puts a caller on hold by pressing the eleventh button from the left ("HOLD" with the cover on), the caller is routed to the audio source, thus hearing music-on-hold when placed on hold.

FRIDAY also comes with a professional call screening function.

In Caller Announce, FRIDAY picks up immediately and plays the main greeting. The caller selects the active mail box [1,2,3,4]. If the mail box is not in Call Forward, Remote Notify, or Pager Notify, the caller then hears a factory prompt, "After the tone, record your name." At the same time FRIDAY plays through the speaker and to the caller, " 'Beep', 'Beep'." Simultaneously, the window for the caller opens for five seconds and the audio path to FRIDAY's speaker is on for the owner to hear the caller. The caller then hears, "One minute please." The caller is automatically sent to music-on-hold. The owner has three seconds to pick up the line. If no pick up, the caller hears factory prompt, "No one is available to take your call." Then the caller hears the mailbox's personal greeting. The message left in the five second window and the message left after the personal greeting

are attached and put in the owner's box as a new message.

FRIDAY allows the user to selectively save and retrieve messages locally and remotely for each of the four personal voice mailboxes. Each mailbox has an optional security code which can be programmed with a 4 digit access code to insure the privacy of all messages. The voice mail system also gives each owner the freedom to store the messages one wants and erase those one doesn't want.

In fact, after each message, the owner can:

- 1) repeat
- 2) save to his/her mailbox
- 3) delete
- 4) replay last five seconds
- 5) pause
- 6) skip to the next message
- 7) skip to the previous message
- 8) hear the time, day, and date of message
- 9) speed up or slow down the message playback speed
- 0) repeat the menu
- *) save to a different mailbox

Of particular uniqueness for an answering system is the ability to save a message to a different mailbox. After listening to a message, the owner can press the eleventh button from the left corresponding to the "star" icon. Then the owner is prompted to select the mailbox where the message should be saved to ([1], [2], [3], or [4]). After the selection, the message transfers from the

original owner's mailbox to its new mailbox location and registers as a new message in that owner's mailbox.

FRIDAY also separates new messages from old messages. For each owner mailbox, FRIDAY displays a count of the number of old and the number of new messages. For instance, when Mailbox 1 is up on the display, you would see "MAILBOX 1", "MESSAGES", "NEW" and the corresponding number of new messages, and "OLD" and the corresponding number of old messages. The same would be true for the other three personal voice mailboxes. When a caller leaves a message, or another owner transfers a message, or a owner leaves a memo, or a timed memo is registered, the message is logged as a new message. The new message becomes an old message when the new message is heard and the owner saves the message by pressing the second button from the left ("SAVE" icon). From that point forward, the message is logged as an old message.

FRIDAY displays and plays back upon request the time, day, and date of each message. No other system provides time, day of the week, and a full day, month, and year stamp for each message. This feature delivers accurate call accounting and solves the problem of remembering who called and when.

In addition to the four personal voice mailboxes, FRIDAY has three additional announcement mailboxes. These serve as an audio bulletin board to leave information for callers- even password-protected, private, outbound, messages- when the owner is unavailable to receive calls. They are capable of delivering updated announcements, addresses, and directions.

The caller would call into FRIDAY. As part of the main greeting, the owner could offer selecting announcement boxes 5,6, and/or 7 for callers to get information. By selecting [5,6,7], the caller would hear the information and then be routed to the main greeting to make another selection or hang up. If the announcement were security protected, the caller would be prompted to input the correct 4 digit access code to hear the information. The caller is given two chances to input the correct code before the unit disconnects.

The announcements are programmed by activating the announcement box from the "SET-UP MAILBOX" option (first button from left with cover off) and then pressing the third button from the left with the cover on ("GREETING/ANNOUNCEMENT") and selecting to record an announcement ([7]). For a private message, the owner would then select "SECURITY CODE" (forth button from the left with the cover on) and input a 4 digit code. While the code exists, the announcement is played to the caller only after he/she inputs the same code when prompted to do so by the FRIDAY.

The eighth mailbox is a passageway to either an attached fax machine or personal computer. FRIDAY features built-in auto-fax detection (implemented by the Control and Voice processing unit (6)) as well as DTMF access to the dataport. This allows the owner to reliably operate a telephone and fax/PC modem on the same line, saving the cost of an additional phone line.

When the caller dials into the FRIDAY and selects mailbox 8 (as opposed to the voice mailboxes/announcement boxes 1,2,3,4,5,6,

or 7) from the main greeting, FRIDAY's ring generator(5) generates a ring to the dataport--an RJ-11 on the back of the unit. When the attached phone, fax machine or PC modem picks up, FRIDAY connect (via the Routing and Switching Matrix (3)) the caller to the line. The caller can then initiate a data session.

FRIDAY can also automatically detects fax tones and activates the fax machine. While playing the main greeting, FRIDAY listens for CNG tones which are sent out by the caller when dialing from a fax machine. When CNG tones are detected, FRIDAY's ring generator generates a ring to the dataport--an RJ-11 on the back of the unit. When the attached fax machine, FRIDAY connect the caller to the line. The caller can then initiate a data session.

Alternatively, the dataport mailbox can be a gateway to the owner's PC. This feature allows PC owners to have access to their PCs remotely. When the caller dials into the FRIDAY and selects mailbox 8 from the main greeting, FRIDAY's ring generator generates a ring to the dataport--an RJ-11 on the back of the unit. When the attached PC modem picks up, FRIDAY connect the caller to the line. The caller can then initiate a data session.

The eighth mailbox also has security protection. Activating the security code is done in the same manner as activating the security code for an announcement box. When the security code is active for the dataport, the ring generator will not ring until the code is correctly entered. Thus, owners can leave their PC's or fax machines available without leaving their equipment directly on-line and vulnerable to tampering or junk

faxes.

FRIDAY performs the traditional receptionist duties of reminding owners of appointments. FRIDAY can store messages and play them at a specific time and date. It can serve as an alarm clock, or as a reminder of upcoming meetings or events. This Timed Memo feature is activated by selecting the sixth button from the left ("TIMED MEMO" with the cover on). The owner is prompted to record a memo. After recording the memo, the owner is prompted to enter the time (HH:MM, am/pm) and the date (MM/DD/YY) when the message should be played back.

When the time and date corresponding to the owner's entry arrives, FRIDAY plays the message which was recorded over the built-in speaker. Then the message is dropped into the corresponding mailbox as a new message.

FRIDAY provides user-friendly voice and visual prompting for quick, easy set-up and on-going operation. FRIDAY is unique insofar as there is only one code which needs to be memorized: the owner defined 4-digit PIN for remote and local access. Every other programming feature requires no memorization of codes or reference to a manual.

FRIDAY has multifunctional keys. For instance, pressing the first key from the left with the cover on ("SELECT MAILBOX") activates a series of voice and visual prompting relevant to selecting a mailbox. Icons appear on the display and the twelve buttons across the base of display function according to the visual/voice prompts (i.e., the first button from the left no

longer represents "SELECT MAILBOX" until the session is complete).

When the cover is off, pressing the first key from the left with the cover off ("SET-UP MAILBOX") activates a series of voice and visual prompting relevant to setting up a mailbox. Icons appear on the display and the twelve buttons across the base of display function according to the visual/voice prompts (i.e., the first button from the left no longer represents "SET-UP MAILBOX" until the session is complete).

FRIDAY is available in either a one-line or two-line configuration. Both are wall-mountable and measure only 8" x 6" x 2.5".

FRIDAY allows the user the convenience of seeing as well as hearing information on its large 1.5" x 6" screen. The display has 189 icons which turn on and off according to the state in which the unit is in. Of particular uniqueness is the date/clock area which doubles as an area for alternative information.

This area in the top right hand corner of the display appears as:

(88/8)8/88-88:88

In its normal, idle mode, this area displays the date and time (e.g, 12/2 8/93 2:30). When any owner is listening to a message, this area displays the time and date corresponding to the time the message was left (e.g., 12/2 6/93 4:30.) When any owner is programming a call forward, remote notification, or pager notification, that area displays the corresponding phone number to that feature (e.g., (20 1)5 55-1212.

FRIDAY ALSO OFFERS:

Speaker Monitor, Security Code Protection for each mailbox, Secure Remote Access, Fully Programmable Remotely, Do Not Disturb, Conversation Recording, Full Battery Backup (to protect the unit from power outages), and Low Memory/Battery Indicator (an indicator flashes when the memory or battery is low). These special built-in features allow the owner to be more productive and professional on the telephone. Also, the unit is compatible with call waiting, distinctive ringing, and three-way calling.

The circuit shown in Fig. 5 is an extremely compact ring generator that produces a modified 20 Hz sine wave. A ring signal with a type B equivalency requires a sine wave of 40 to 150 vrms at 15.3 to 68 Hz. For this design 60 vms was chosen. This insures that the circuit will ring devices designed for standard telephone lines. The design utilizes high frequency switching technology in a tapped inductor boost topology. This topology applied to a ring generator allows for low cost and low parts count. The design exploits features found in integrated switching regulator ICs recently offered by several manufacturers. By initializing this type of IC in a unique and unintended mode of operation, an extremely small and low cost design solution was obtained for devices which are required to generate standard ring signals. The transformer alone in a traditional ring generator requires more than ten times the size of this completed design.

Referring now to Fig. 5, U1 is a completely integrated current mode switching regulator IC. It requires only a few

components for proper operation. Its intended purpose is to provide regulated DC output at a voltage specified R7 and R5 feedback resistors. However, by modifying the feedback current by summing an ac current in the feedback loop via C77, a ring signal with the required amplitude be generated.

The switching topography is established by L1. Tapping L1 as an auto transformer with a specific turns ratio allows the required voltages to be developed at the cathode of D3 without exceeding the maximum breakdown voltage of U1.

U41 gates B and C generate a square wave at the required frequency. Filter network consisting of C1, R1 and C5 provide a modified sign wave to modulate the feedback at U1 pin 3. R2 and D5 modify the bias point during the ring on state. Q1, D5 and R4 create a negative going follower stage to sink ac return current during the negative going portion of the sign wave.

As shown in Figure 7, the unit connects to the central office (CO) exchange through connectors TEL 1+2 and TEL 2. Ring detectors 54 for line one and 68 for line two provide the DSP central processing unit (CPU) 10, shown in Figure 6, information when the CO sends ring to either line. During this time, telephones connected to TEL 1, 2 or TEL 2 also ring. The CPU 10 then determines if and when to respond to ring. If the CPU determines that for example line 1 should be answered, a DC loop circuit is completed by the closing of relay K1. Loop current will then flow through loop detector 52 then loop holding and isolation network 50. Audio can then be received from or transmitted to the telephone line via the terminated 2-wire to 4 wire converter 48. Loop detector 52 provides the CPU with loop current status. This detector is used for central offices that supply calling party control pulses (CPC) for disconnect. The same is true for line 2 with relay K2, loop detector 66, loop holding and isolation network 64, and terminated 2 wire to 4 wire converter 62.

An additional RJ11 type jack marked Fax is supplied for a fax machine or additional telephone. Relay K4 switches the fax machine between central office lines or Friday's local ring and loop current generator 56. When relay K4 is in CO access state, relay K3 selects which line the fax machine is connected to. When relay K4 is in local ring/loop state, loop detector 60 provide the CPU 10 with fax machine off-hook information.

Ring and loop generator 56 is an extremely compact circuit. It utilizes a high frequency switching supply IC in a tapped inductor boost topography. By utilizing this topography and switching supply IC in a unique and unintended mode of operation, an extremely small and low cost 20 Hz ring and loop generator was obtained. Referring now to the circuit in figure 6, U1 is a completely integrated current mode switching regulator IC. It requires only a few components for proper operation. Its intended purpose is to provide regulated DC output at a voltage specified by R7 and R5 feedback resistors. However, by modifying the feedback via C77, a ring signal with the required amplitude and frequency can be generated. The switching topography is established by L1. Tapping L1 as an auto transformer with a specific turns ratio allows the required voltages to be developed at the cathode to D3 without exceeding the maximum breakdown voltage of U1. U41 gates B and C generate a square wave at the required frequency. Filter network consisting of C1, R1, C5 provide a modified sine wave to modulate the feedback at U1 pin 3. R2 and D5 modify the bias point during ring state. Q1, D4 and R4 create a negative going follower to sink return current during the negative going portion of the ring sine wave. U2 sections A and D are

used to switch between Ring and loop current states. Gate U2A, resistor R2 and D5 are used to modify the voltage output during loop current generation. Gate U2D prevents the 20Hz signal from being applied to the feedback network during loop current mode.

Audio interface to the telephone lines occurs in audio switching matrix 36. RZ1 and RX3 are audio signals being received from the telephone network. TX1 and TX2 are audio signals sent to the telephone network. Outgoing messages are recorded at microphone MIC. The signals are amplified by microphone amp 44 and switched at audio Matrix 36. Optional hold music can be supplied to Friday via MUSIC ON HOLD INPUT. Buffer amp 70 provides current amplification and peak limiting. Hold phrase 72 gives Friday the ability to provide callers on hold speech phrases like "we will be with you in a moment" while the other line is being answered. Hold music and voice are switched to line 1 or 2 by matrix 36. Audio signal from the CO lines pass through 38 automatic gain control. The gain control provide consistent audio levels for speaker monitor features, message record functions and DTMF/call progress signalling tones. Audio signals to be processed by the DSP CPU are filtered and digitized by 32 National Semiconductor's CODEC/FILTER COMBO TP3054 IC family. The CODEC is capable of converting digital data to audio signals for playback while simultaneously converting analog signals to digital signals for DTMF detection. FAX CNG detection for auto fax switching is done by 46, 1.1 KHz phase lock loop tone detector. Attenuator 34 adjusts the CODEC output to compensate for difference between voice prompting level and message level. A speaker is provided with different modes of operation for listening to messages, voice prompting and monitoring telephone lines. Analog switch 39 selects between receive and transmit depending on what mode the speaker is in. Volume control 40 adjusts listening level. Audio amplifier 42 drives the speaker.

Digital data passes through a series interface between 32 CODEC and 10 DSP cpu. National Semiconductor's DSP CPU NS32A 162 handles audio processing including recording, playback, DTMF/progress tones reception, DTMF dial out. The processor also handles input ports 28 and output ports 30 for all other blocks indicated in this description. The CPU accesses user buttons and switches 24 and sends information to Liquid crystal display 20. Program memory, dynamic ram, and non-volatile ram memory are provided in block 14. Program memory provide the CPU instructions for processing and data lookup tables. Dynamic ram is used for program variables and message storage. Non volatile memory is used to store configuration information. Memory expansion 18 is an optional slide in module containing additional DRAM for the purpose of doubling message storage time.

Power supplies start with 9vac input from a wall transformer. Rectifier and filter 74 converts the AC sine wave to a DC square wave with the same frequency as the 9vac. The square wave is used as a time base for the system clock. Analog regulator 78 supplies voltage for ICs that process audio. Digital regulator 80 supplies voltage for ICs that process audio. Digital regulator 80
5 supplies voltage for all digital ICs. a 9 volt battery provides backup power during power failures. Backup supply 82 senses the start of a power failure and switches in the backup supply. Voltage monitor 84 detects low power and low battery. The CPU uses those signal to go into backup and to display low battery icon.

The **Fax unit** is an advanced all-digital fax and telephone answering system. The product will have the same appearance as the current **FRIDAY** and will plug into the phone jack. Two phone lines will then run from the **Fax unit** to both the office fax machine/PC and the office telephone. The current version is one-line only; a two-line version will be considered as a second generation product. The **Fax unit** will enhance the capabilities of existing fax machines/PC fax modems and replace the office telephone answering machine.

Fax unit can receive voice and fax messages to one of 4 personal mailboxes; provide callers with hard-copy access to documents via fax to any remote location; allow owners to retrieve faxes and voice messages locally or remotely; broadcast faxes to multiple locations; send faxes at specified times and dates; and automatically retransmit faxes to busy fax machines.

When a caller reaches the **Fax unit**, he/she is presented with an owner-recorded menu. The unit can offer callers access to up to 8 different mailboxes. Mailboxes 1, 2, 3 and 4 are personal mailboxes. Mailboxes 5, 6 and 7 are fax-on-demand mailboxes which each store one document for the caller to retrieve from their fax machine. Mailbox 8 can be configured like mailboxes 5, 6 and 7 (i.e., one document retrieval) or the selection of mailbox 8 can route the caller to a menu of up to 9 sub-documents from which the call can select to receive documents automatically.

For instance, a caller could hear, "Welcome to ABC Plumbing. For Ron, press 1; for Tom, press 2; for John, press 3, for Jose, press 4; to receive a fax on pricing information, press 5; to receive a fax on solving drain problems, press 6. For a fax on installing a sink, press 7, to hear a fax on demand menu of sink spec sheets."

Callers are prompted to indicate via their dialing pad to whom they are either sending their fax or leaving a voice message; or to which fax-on-demand menu they want to access. Faxes sent without designation are interpreted as going to the default Mailbox 1, and are routed to the fax tray or a public mailbox, according to the owner's specification for Mailbox 1. The default for Mailbox 1 is to bypass the **Fax unit** and go to the fax tray. If no DTMF is selected and no CNG is deducted after the main greeting, the unit interprets the call as a voice call from a caller without DTMF capability. Thus, the caller is routed to Mailbox 1 and to the greeting for the mailbox in order to leave a voice message.

Features of Mailboxes 1, 2, 3 and 4

5 **Fax unit** provides up to four personal mailboxes, allowing co-workers complete control over their individual communications. Each mailbox is programmable independent of the other mailboxes so that, for instance, Mailbox 1 can be in the bypass mode while Mailbox 2 is non-bypass/fax forward mode.

10 Mailbox 1 serves as the default mailbox in the event that the caller presses "send" automatically on his/her fax machine without making a DTMF selection. If there is only one user, it is recommended that the owner reside in Mailbox 1 and simply prompt callers to press "start" on their fax machine to send him a fax. If there are multiple users, it is better to use Mailboxes 2, 3 and 4 as personal mailboxes and direct callers to press "start" to send a fax to anyone else in the company (Mailbox 1). Others may prefer to have the boss or the secretary manage Mailbox 1 since all default faxes are routed to this location. Each mailbox has the option to activate and program a four-digit security code to block local access the mailbox.

15 As mentioned above, the caller will first hear the main greeting when calling in and either makes a DTMF selection, or disregard the menu and press start/autosend on his/her fax machine, or make no DTMF selection and no CNG (when calling from a pulse telephone). **Fax unit** waits on the line for DTMF or CNG to determine how to process the call (if the caller makes no DTMF selection or does not send a fax, the unit routes the caller to the greeting in mailbox 1). Upon determining the destination of the caller, the caller is routed to the mailbox's personal greeting (The owner of
20 each box can record his/her own mailbox personal greeting. The unit has a default greeting which plays when no greeting is present, "Press start on your fax machine or leave your message after the tone,") If CNG is not detected, the unit assumes that a message is being left. The caller can then leave a message (The unit ends the recording when it detects a "star" key input, 7-seconds silence/VOX or when the unit reaches the maximum message length of either 1, 2, or 3 minutes -
25 as determined by the owner. If the unit times out or runs out of memory and has to cut off the caller, the unit states, "Your message has been saved.") If on the other hand CNG is detected, **Fax unit** checks to see if the mailbox is in Bypass mode (if CNG is detected during the main greeting, unit only checks Mailbox 1) or non-Bypass mode. In terms of fax priority, Bypass On/Off is the first thing the unit checks to determine how to process the fax call. If the mailbox is in Bypass **Fax**
30 **unit** generates a ring to the attached PC of fax machine. If the attached unit picks up within 3

rings, the call is passed through and the fax goes to the attached PC or fax machine. If **Fax unit** does not get a pick up after 3 rings, the fax goes into the mailbox and the LED goes on (Owners are instructed to set the ring pick up on their attached fax machine or PC to one ring).

If the unit is not in Bypass mode (in other words the owner wants faxes to be stored in the **Fax unit**), the caller is then prompted to "Press start on your fax machine now or "pound" to cancel." (If CNG is detected, unit gives answer back from the **Fax unit** immediately and eliminates the prompt). The fax is then stored in the mailbox and the LED goes on. In the event that the memory is filled during the session, the partial fax is saved and an error message is communicated. Once memory is full, the unit goes into Bypass mode but still offers the menu so that owners will still have the ability to remotely retrieve and delete faxes in order to free up the memory.

The next priorities (in order of priority) for the **Fax unit** are Fax Forward and then Remote Notification. Activating either or both of these features automatically puts the **Fax unit** in the non-Bypass mode.

Fax Forwarding

Fax Forwarding allows the owner to have the unit automatically fax each of the incoming faxes to a specific remote fax number after the fax is received. After the fax is received, **Fax unit** takes the outside line and calls the pre-programmed number. Each mailbox can have a different Fax Forward phone number. After successfully transmitting the fax, the fax is saved in the system as an old fax, regardless of whether the owner has programmed his/her faxes to be in the print-delete mode (see Fax Retrieval section for description of how faxes are retrieved). **Fax unit** will try calling twice--immediately after the fax is received and ten minutes after that. If the fax is successfully sent the first time, the second attempt is aborted. If both attempts fail, the unit will attempt to send the failed fax when a new fax arrives, assuming the unit is still in the Fax Forward mode.

Remote Notification

Fax unit can notify the owner to either a remote phone or to a pager whenever a voice message or fax is received. When the remote notify feature is active, after each voice message or fax is received, **Fax unit** takes the outside line and calls a pre-programmed number. Each of the Mailboxes can store a different Remote Notification number. **Fax unit** will call twice --

immediately after the voice message or fax is received and ten minutes after that. The unit has a pre-programmed message which informs the owner that there is a message in his/her mailbox ("Fax unit here with a message for Mailbox [1, 2, 3, 4]"). The owner is then prompted to input his/her security code and then is presented a menu of activities. If a security code is successfully entered during first remote notify attempt, the unit assumes a successful Remote Notification and does not make a second attempt after ten minutes. (The remote activation section gives more details on Fax unit's remote capabilities).

When calling a destination which is a pager, the unit behaves identical to the description above. Since the Fax unit has the ability to store up to thirty digits and dial a number, input pauses, and continue dialing, the owner can have the remote notify feature dial his/her pager, pause and then input a code which would prompt the owner to check his/her unit. The unit would still prompt the paging company to input a security code as described above. Since the recipient of the call will be a machine, the prompt will be disregarded and the Fax unit would time out after thirty seconds when the owner did not respond to the security code prompt. Thus, the owner will be double paged whenever using the remote notification feature with a pager.

Other Mailbox 1, 2 3 and 4 Features

Features associated with the personal mailboxes beyond those discussed above (i.e., bypass, forwarding of all faxes to a remote location and remote notification of fax receipt) include security protection, remote retrieval of voice messages and faxes, local retrieval of voice messages and faxes, and PC or fax interface. All these features can be programmed locally and remotely by accessing the mailbox and then following voice prompts.

Security Protection

Each mailbox can be programmed with a 4-digit security code to block local access to mailbox's contents and program parameters (i.e. FaxForward, Bypass, Remote Notify, Print-Save or Print-Delete). For remote activities, the 4-digit code must be entered to gain access to the system, even if the security protection is inactive locally. The default setting is the Mailbox's number four times (i.e. 1111, 2222, 3333, 4444). The unit has a back door for those who forget their code. The back door can only be activated locally. This back door resets the mailbox's pass code to the default number and clears the memory of all faxes stored to the mailbox. This back door is incorporated

into the unit to allow mailboxes to be deleted or reset without powering down and losing all the set-up parameters and faxes in the other mailboxes. Whenever the owner or caller reaches a prompt for entering a security code, the prompt is "Enter security code or press pound to exit." Pressing pound takes the caller or owner back to the previous menu selection. Attempting to enter a number, if incorrect, results in a second prompt to enter a security code without the exit option ("Enter security code"). An incorrect second attempt ends the session by disconnecting the caller or the owner and returns the unit to the idle state.

Voice Message and Fax Retrieval

Voice messages and faxes sent to the Fax unit (i.e., stored in the unit) are stored in the four mailboxes. Any voice message or fax received in the unit is stored as a new voice message or fax and activates the LED. So long as there is a new voice message or fax in any mailbox that has not been reviewed, the LED remains lit. Once a voice message or fax has been reviewed and saved, it is stored as an old voice message or fax. Other options while reviewing voice messages or faxes are outlined below.

Retrieval Options

As part of managing a mailbox, the owner can access higher voice messages and faxes locally or remotely. When accessing voice messages or faxes, the owner is greeted with the number of new voice messages and faxes in the mailbox. If the memory is running low, there is an additional prompt warning him/her that the memory is running low, there is an additional prompt warning him/her that the memory is running low (there is also a visual "low memory" indicator). After this prompt, the owner is offered options as described in the February 7th diagram/spec faxed to us by Oded Morag which is attached. The only issue not addressed in his spec which will be in the unit is the option to print-delete versus print-save. In addition, the details of the LIST option and the specifics on how the unit tags incoming faxes needs to be finalized.

Remote Fax Retrieval and Remote Programming

As described above, incoming voice messages and faxes can be stored digitally in the Fax unit instead of printing directly to your fax machine. This allows the owner to call in from a telephone and retrieve voice messages; or call in from a fax machine or a PC fax modem and retrieve faxes, or to call from a telephone and input a fax phone number to which the owner wants the faxes

forwarded to. When calling remotely, the caller hears the main greeting and makes a mailbox selection, then at the prompt, the owner press "star." The owner is then prompted to input a security code described above. Once the code is successfully entered, the owner is offered the options described in Oded's spec.

- 5 These options are heard over the phone so that the owner does not have to memorize additional codes. Remote programming is identical to local programming once the owner enters the programming mode. Each of the owners can program any parameter-both parameters which only effect their individual mailboxes and parameters which are global.

Local Fax Retrieval to a fax machine or PC

- 10 As mentioned, incoming faxes can bypass the Fax unit and go straight to the attached fax machine or PC. Alternatively, incoming faxes can be stored in the Fax unit and downloaded locally to an attached PC or fax machine at the owner's convenience. there is one RJ-11 for a phone and another RJ-11 for the dataport -- either the fax or a PC. When going to a fax machine, Fax unit rings the fax machine locally and engages the attached fax machine in a fax session. If the attached fax
15 not answer, Fax unit times out and display an error indicator on the display. If the attached fax answers and the session is interrupted (e.g., run out of paper), the unit still makes three attempts before signalling an error. Certain events have priority over a downloading session. If the phone line rings during the session, Fax unit aborts and answers the line. The owner also has the option to abort the session for any reason. Within a particular downloading session, the

- 20 Instead of interfacing to a fax machine, the owner can elect to have the Fax unit interface with a PC fax modem. The unit will use WinFax as its standard for interfacing with fax modems. (As a marketing exercise, we will explore bundling WinFax with the Fax unit.). The PC interface feature provides the ability to preview, delete, save, and print faxes to plain paper without having to leave the PC on and attached to a fax telephone line 24 hours a day.

25 Features of Fax-On-Demand Mailboxes

As mentioned previously, callers can be given the option of selecting a fax-on-demand mailbox to receive information to their fax machine on a same-call basis. Fax unit allows the owner to provide maps, spec sheets and other documents for callers to access from their fax machine. Callers can

either get a fax immediately (mailboxes 5, 6, and 7) or select to hear from a menu of documents (mailbox 8), make their request from the dialing pad on their fax machine, and immediately receive their information. Documents are entered into the Fax unit through the local fax machine or PC fax modem. The unit also has type-ahead capability so that the owner can either prompt the caller to select 8 to hear a menu (e.g., "to hear a menu of documents you can receive by fax on cars press 8) or can incorporate specific FOD selections in the main greeting (e.g., "to receive information by fax on Toyota press 81, on Subaru press 82, or Mazda press 83, on Ford press 84, on General Motors press 85"). Under the first case, after the caller select the mailbox, the caller would hear an owner-recorded menu of documents from which to select. Once the caller makes his/her selection (DTMF 1, 2, 3, 4 or 5), the Fax unit prompts the caller to "press start on your fax machine now." If start is not detected within 15 seconds the unit repeats the prompt. If start is not detected within the next 15 seconds, the unit disconnects. If start is detected, the Fax unit gives an answer-back and the session begins. With this system, the caller can only select one document per session and the session can only take place as a "same-call." A call-option is not provided.

15 Security Protection

Security protection resides at the mailbox menu-level for personal mailboxes and the fax-on-demand mailboxes (when a caller is accessing remotely) not the document-level. Both mailboxes can be programmed with a 4-digit security code to block remote access to mailbox's FOD contents. When the security protection is active, the 4-digit code must be entered by the caller to gain access to the menu and documents within the mailbox. The default setting is the Mailbox's number four times (i.e., 5555, 6666). The unit has a back door resets the mailbox's pass code to the default number and clears the memory of all faxes stored to the mailbox. This back door is incorporated into the unit to allow mailboxes to be deleted or reset without powering down and losing all the set-up parameters and faxes in the other mailboxes. If the caller selects a FOD mailbox which has the security protection active, the caller is prompted to enter a security code, "Enter security code or press pound to exit." Pressing pound takes the caller or owner back to the main greeting. Attempting to enter a number, if incorrect, results in a second prompt to enter a security code without the exit option. ("Enter security code"). An incorrect second attempt ends the session by disconnecting the caller or the owner and returns the unit to the idle state. If the security code is correctly input, the unit plays the owner-recorded menu and continues as described above.

Fax Broadcast

Beyond receiving faxes, **Fax unit** can also send faxes on behalf of the owner. In fact, **Fax unit** can take the same document and send it to multiple fax numbers. **Fax unit** can store up to 99 fax numbers in a central pool. In addition to residing in this pool, each number can be assigned to one or multiple workgroup lists. **Fax unit** holds up to 3 of these lists. New numbers can be added directly to any of the lists (in which case the number is copied in parallel to the pool automatically) or can be added directly to the pool. Additional options related to the Fax Broadcast list include replacing, deleting, copying to another list (1, 2 or 3), entering a new number, moving on to view the next number, printing a log, and exiting. When scrolling through the pool or individual lists, **Fax unit** displays the number, and the lists where the number resides. In addition, **Fax unit** reads out the number. When sending a fax broadcast, the owner enters a document into the unit by scanning a page through the fax machine or downloading from the attached PC fax modem. The owner selects to have the fax broadcasted to the pool or to list 1, 2, or 3. The owner can also specify when the broadcast session should begin (i.e. either ASAP or at a specified time and date in the future). The owner can also specify how many times will the **Fax unit** try each number (1, 2 or 3 attempts is the option). **Fax unit** will begin broadcasting according to the owner's input. The unit will begin with the first number in the list, dial and try to send a fax. If the **Fax unit** is unable to successfully transmit to a particular number, the number goes to the back of the queue. Once **Fax unit** has made one attempt at each number, it will check to see how many iterations were programmed and then retry the unsuccessful numbers. While the unit is in the broadcast mode, there is a visual indication so that the owner does not interrupt the session accidentally. The owner however can abort the broadcast session from the **Fax unit**. When the broadcast session is complete, a log is automatically generated. The log can be viewed on the **Fax unit** display or printed out on a log. The log lists the numbers which were attempted and whether each was successful or not. Successful documents will have a time or receipt while unsuccessful document would list the times when the transmissions were attempted.

Times Fax Delivery

A featured related to the Fax Broadcast is Timed Fax Deliver. This feature allows owners to program a time and date to send a fax, allowing the owner to send faxes when telephone rates are cheaper or when the addressee can receive the fax (e.g.k when the fax line is not busy). Documents are entered into the **Fax unit** through the local fax machine or PC fax modem. The owner would

then program either a fax phone number or a code corresponding to a number stored in the pool. The owner would also input a time and date for the Fax unit to begin faxing. Fax unit can hold up to five Timed Fax documents at any moment, the unit will make three attempts to send a fax: at the programmed time, ten minutes later, and two hours later. This is a factory setting which we will determine. Fax unit prints a log at the conclusion of a successful transmission or after the third failed attempt with the details of the three tries.

Busy or Memory Fax Delivery

Another feature related to the Fax Broadcast is Busy or Memory Fax Deliver. This feature allows owners to program a fax to be sent ASAP, allowing the owner to move on to other activities and leave the Fax unit to send the fax. Document are entered into the Fax unit through the local fax machine or PC fax modem. The owner would then program either a fax phone number or a code corresponding to a number stored in the pool. The owner would not input a time and date for the Fax unit to begin faxing since fax attempts begin immediately. Fax unit can hold up to five Busy/Memory Fax documents at any moment. The unit will make three attempts to send a fax: immediately, ten minutes later and two hours later. This is a factory setting which we will determine. Fax unit prints a log at the conclusion of a successful transmission or after the third failed attempt with the details of the three tries.

Other Global Features

Fax unit has auto-fax detection and maintains a log file similar to all fax machines. Other programmable features not mentioned in detail include ring count, time/day, main greeting, memory check. The basic unit will be configured as 30 pages expandable to 60 pages. However, the Fax unit can also be configured as 60 pages expandable to 120 pages; or 30 pages to 90; or 60 pages to 90 pages.

The CPU section of the non fax unit utilizes National Semiconductor TP3054 CODEC as a digital to analog and analog to digital converter chip. The National Semiconductor NS32AM162 is used as the digital signal processor and system controller chip. Finally, National Semiconductor 1MEGX4 AUDIO DRAM chips are used to store messages.

The fax unit uses a different CPU section than the voice only units. The improved DSP capabilities of the chip set used in the CPU section allows the fax unit to process fax data. The chip set consists of a National Semiconductor NS32FV100-20 System Controller. The System controller's major functions are to coordinate the DRAM memory access, control system I/O and provide a full duplex Sigma-Delta CODEC for the DSP processor. Also utilized in the fax unit is

the National Semiconductor Advanced Communications Signal Processor which is a high speed DSP chip optimized for CCITT Group 2 and Group 3 facsimile applications among other DSP applications.

5 The CPU section of the fax unit contains up to 0.5 megabytes of ROM and up to 3 megabytes of DRAM memory for storing fax and voice messages. Various other circuits and components needed for proper integration of the major components are also included in the CPU section.

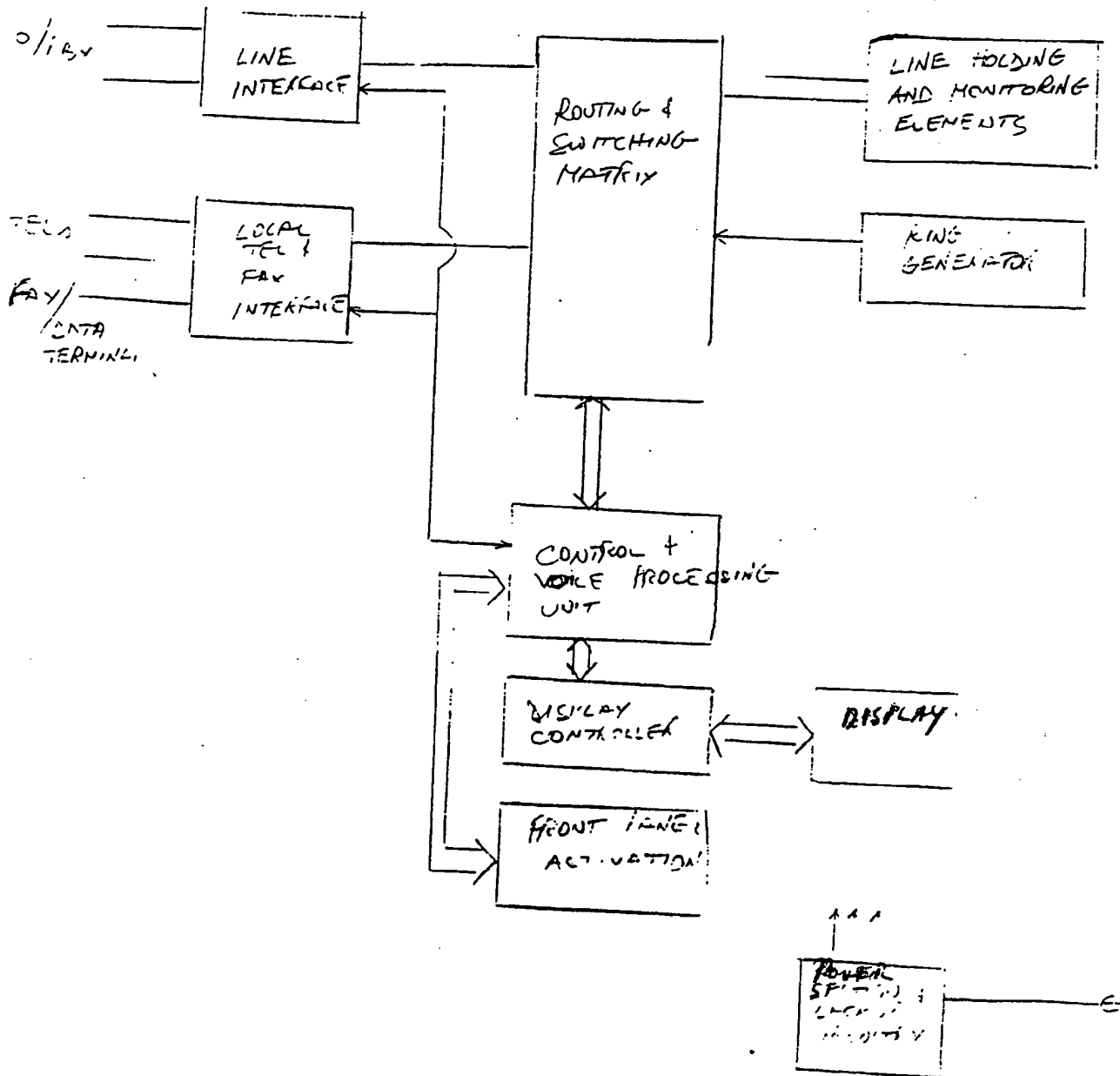
We claim:

1. A telephone answering and voice messaging system comprising:
 - means for providing separate voice mailboxes;
 - means for providing digital memory;
 - means for providing music on hold;
 - means for forwarding calls; and
 - means for detecting and routing data transmission to a fax machine or PC.
2. A telephone answering and voice messaging system comprising:
 - means for providing separate voice mailboxes; and
 - means for providing digital memory.
3. A ring generator for use in a compact telephone answering and voice messaging machine comprising:
 - a completely integrated current mode switching regulator IC;
 - means for modifying feedback current by summing an ac current in a feedback loop;
 - means for generating a square wave;
 - means for providing a modified sine wave; and
 - means for creating a negative going follower stage to sink ac return current during the negative going portion of the sign wave.

Abstract

The Friday personal office receptionist is an advanced all digital answering machine. It is capable of handling telephone more effectively than currently available units. It utilizes a digital signal processing (DSP) micro controller for digital message recordings and advanced features such as call forwarding, remote notify and auto fax detection.

5

Fig. 1

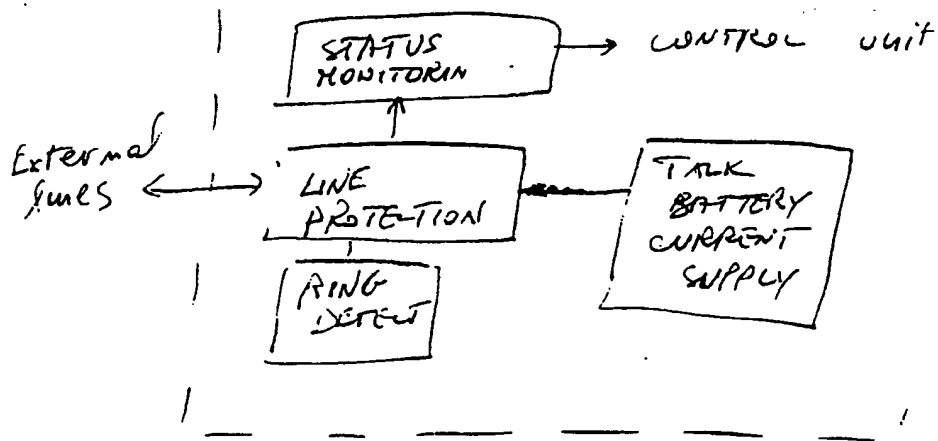


Fig. 2

LINE INTERFACE

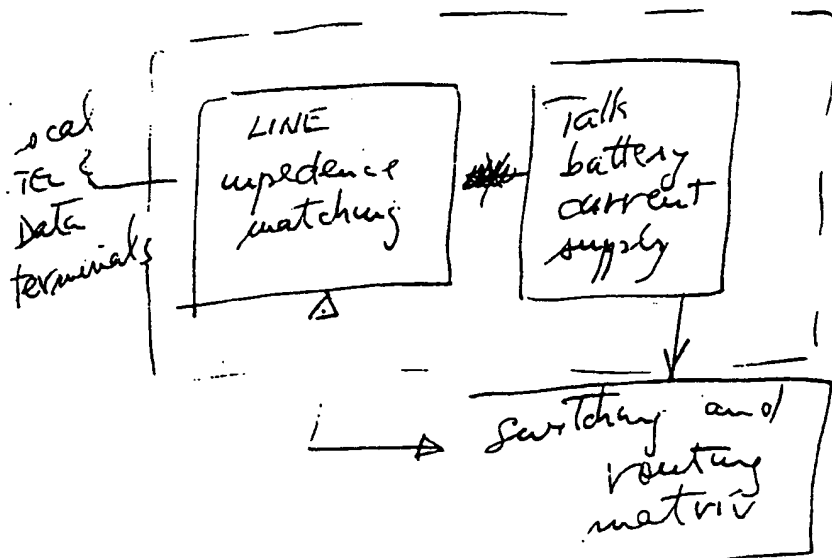
LOCAL TEL &
DATA INTERFACE

Fig. 3

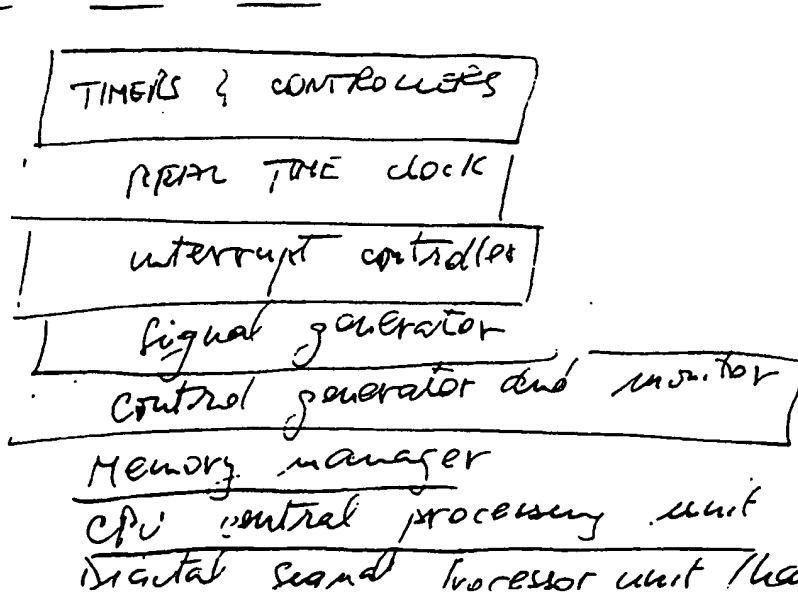
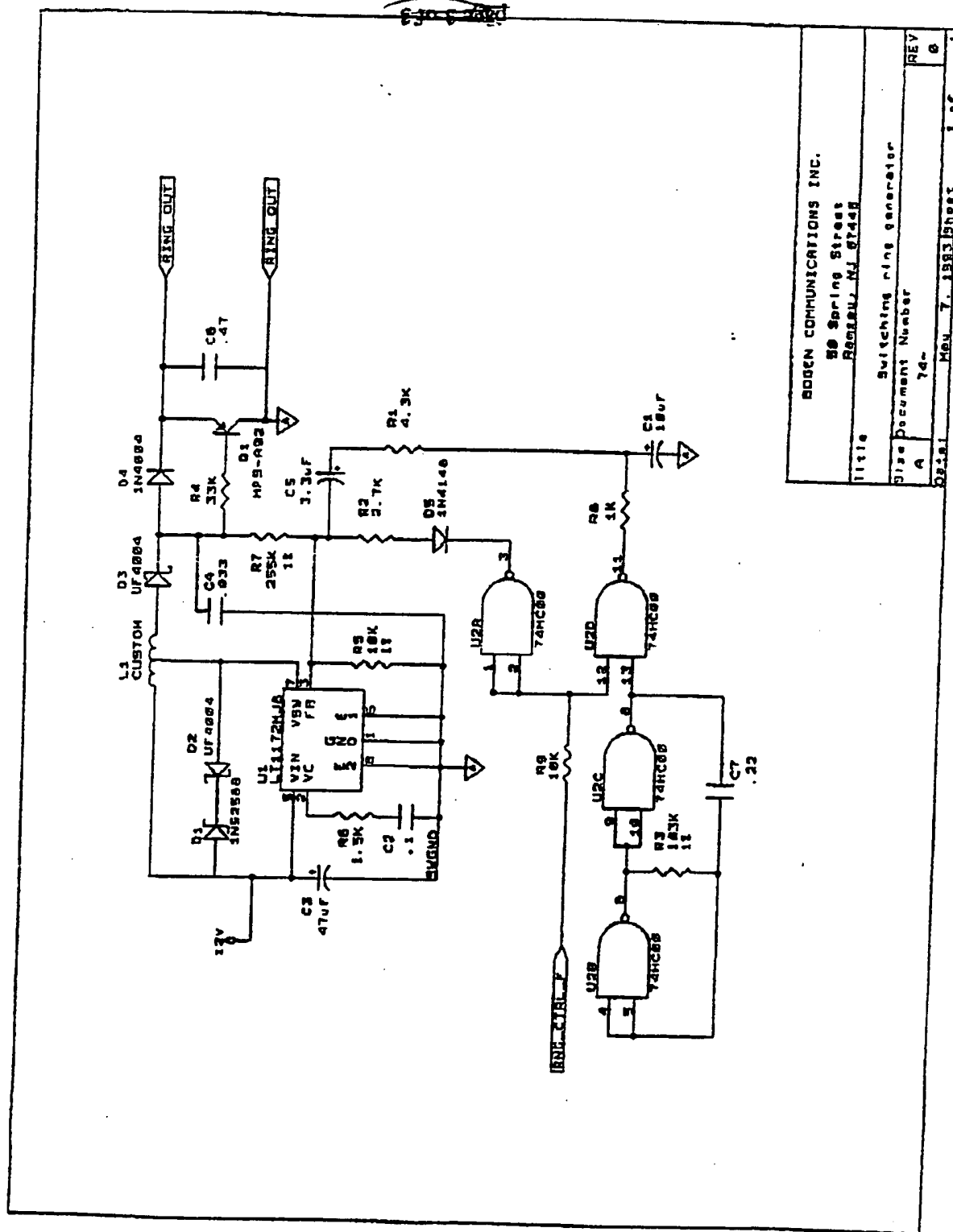
CONTROL &
VOICE PROCESSING
UNIT

Fig. 4

Fig 5



Bohn
Proprietary

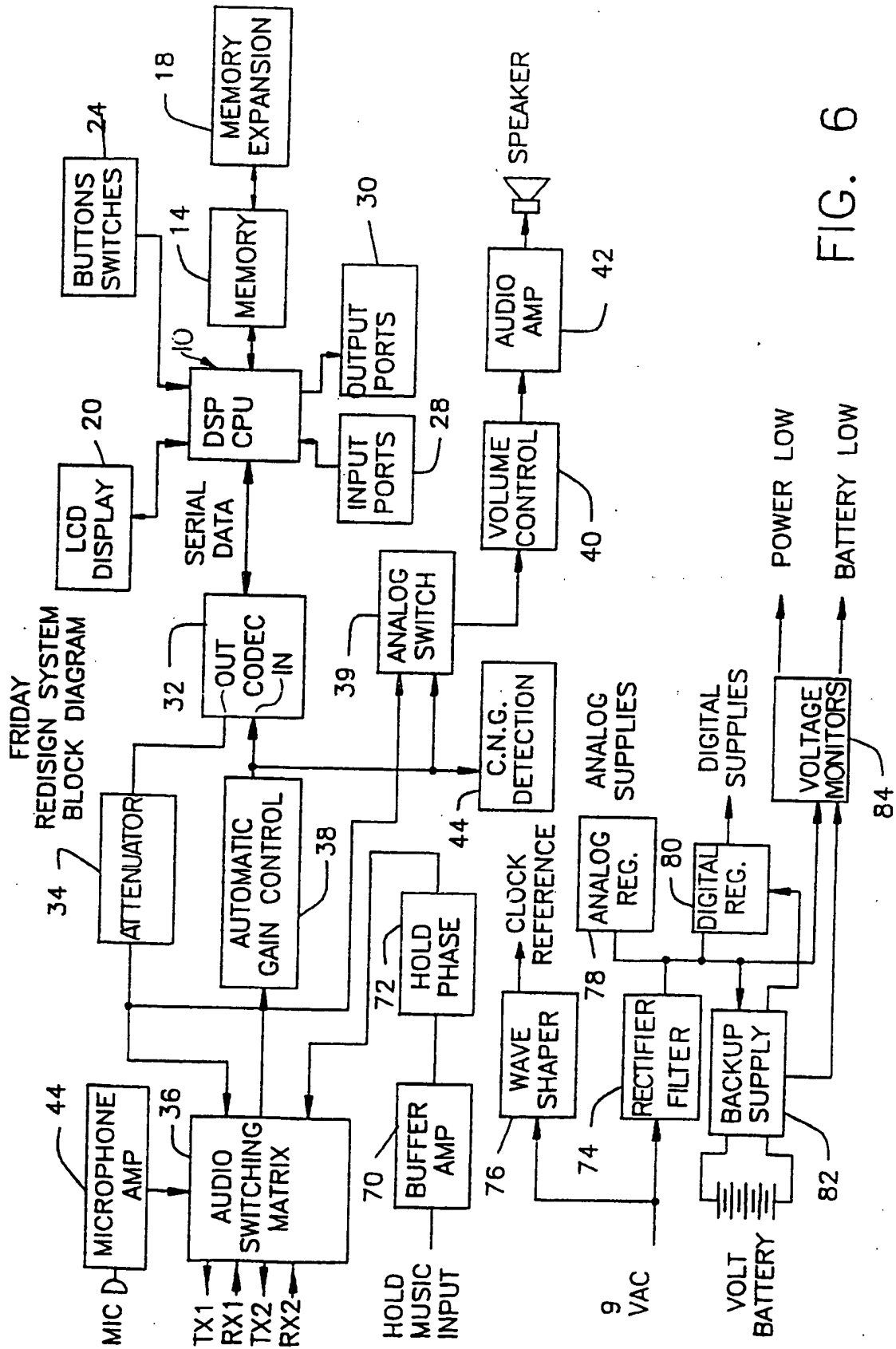


FIG. 6

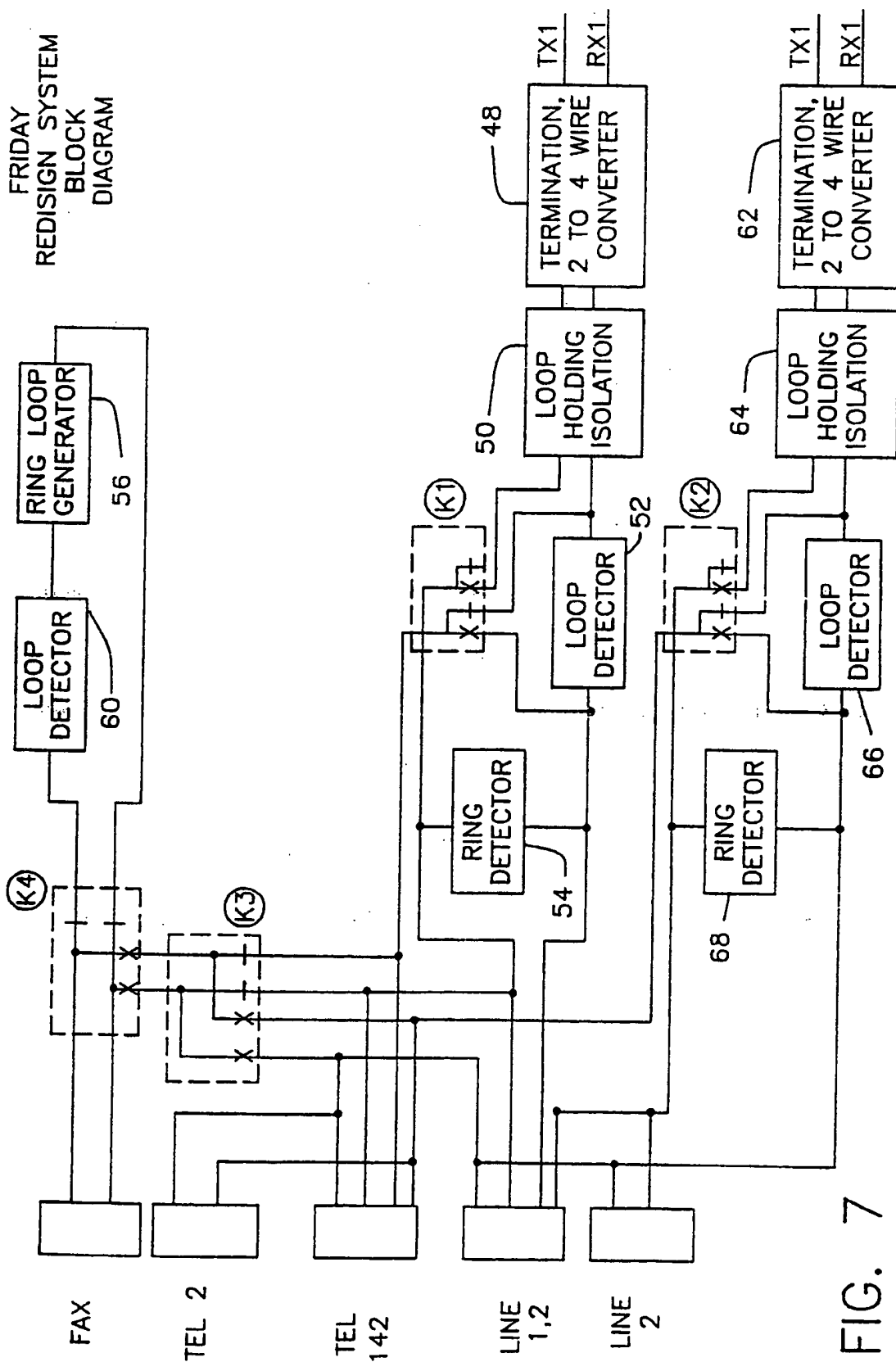
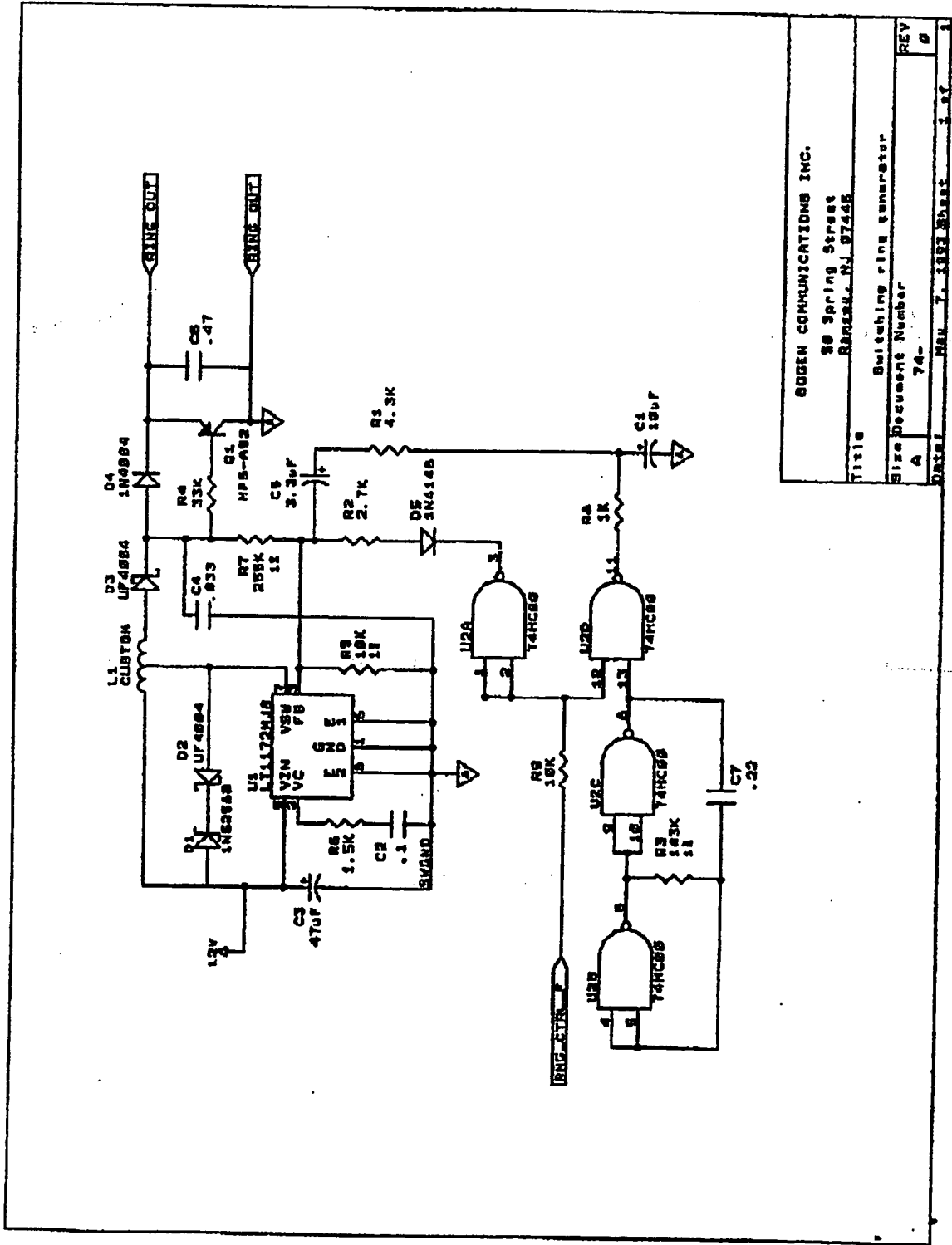


FIG. 7

Fig. 8



BOGEN COMMUNICATIONS INC.
 80 Spring Street
 Roseland, NJ 07468

Title: Switching ring generator

Size: Document Number: A

Rev: 0

Date: May 7, 1993 Sheet 1 of 1

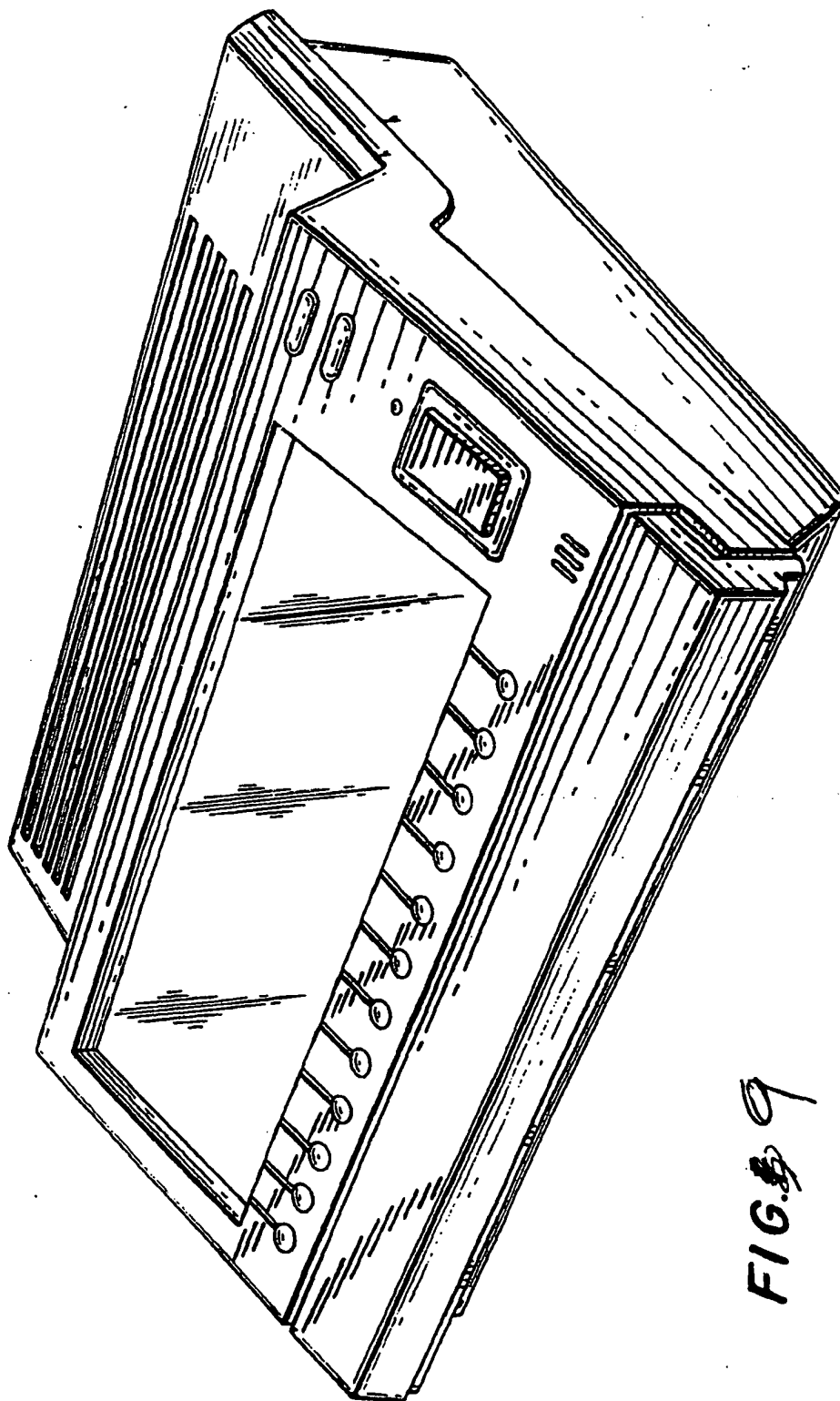


FIG. 9

Fig. 10

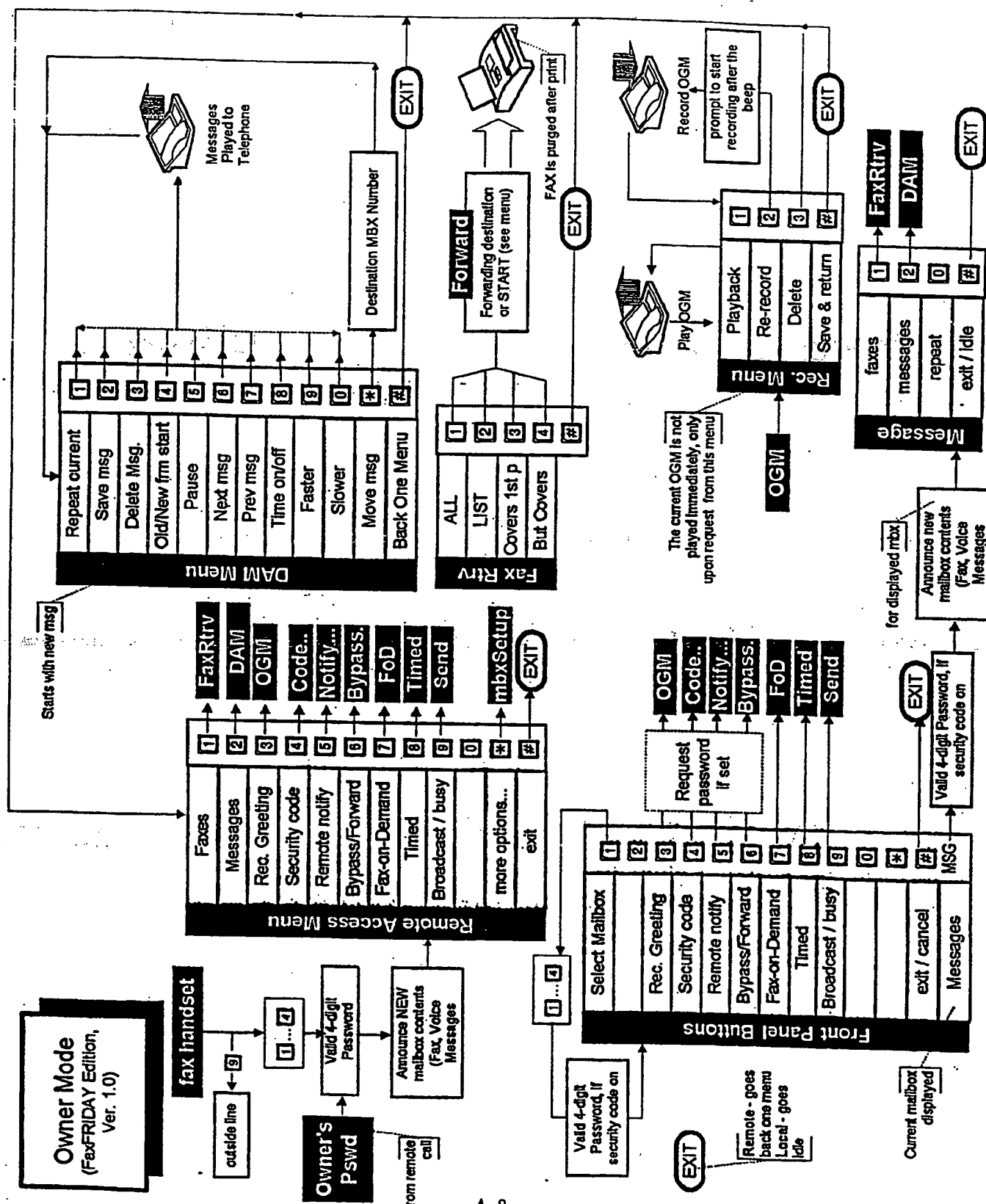


FIG. 12

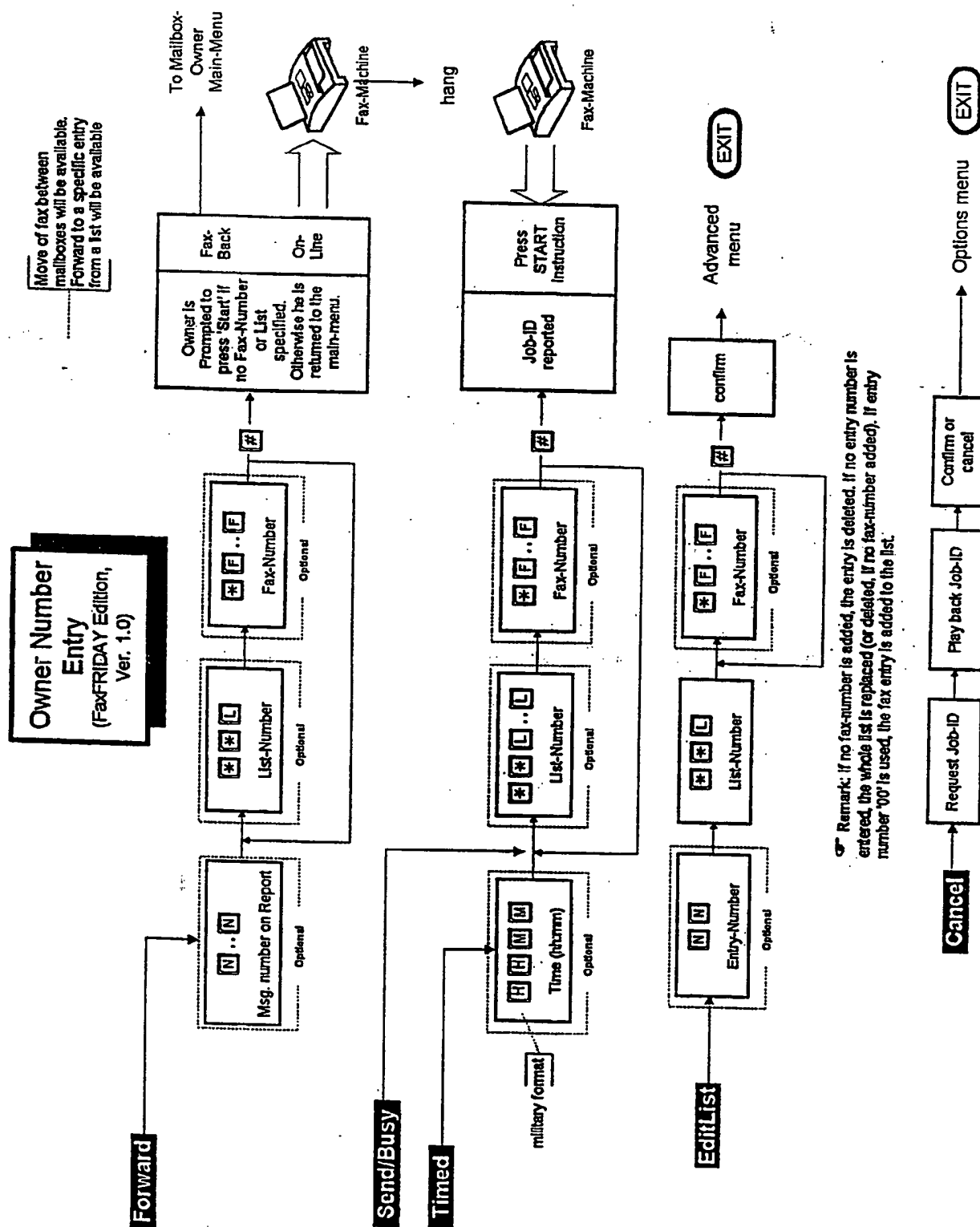
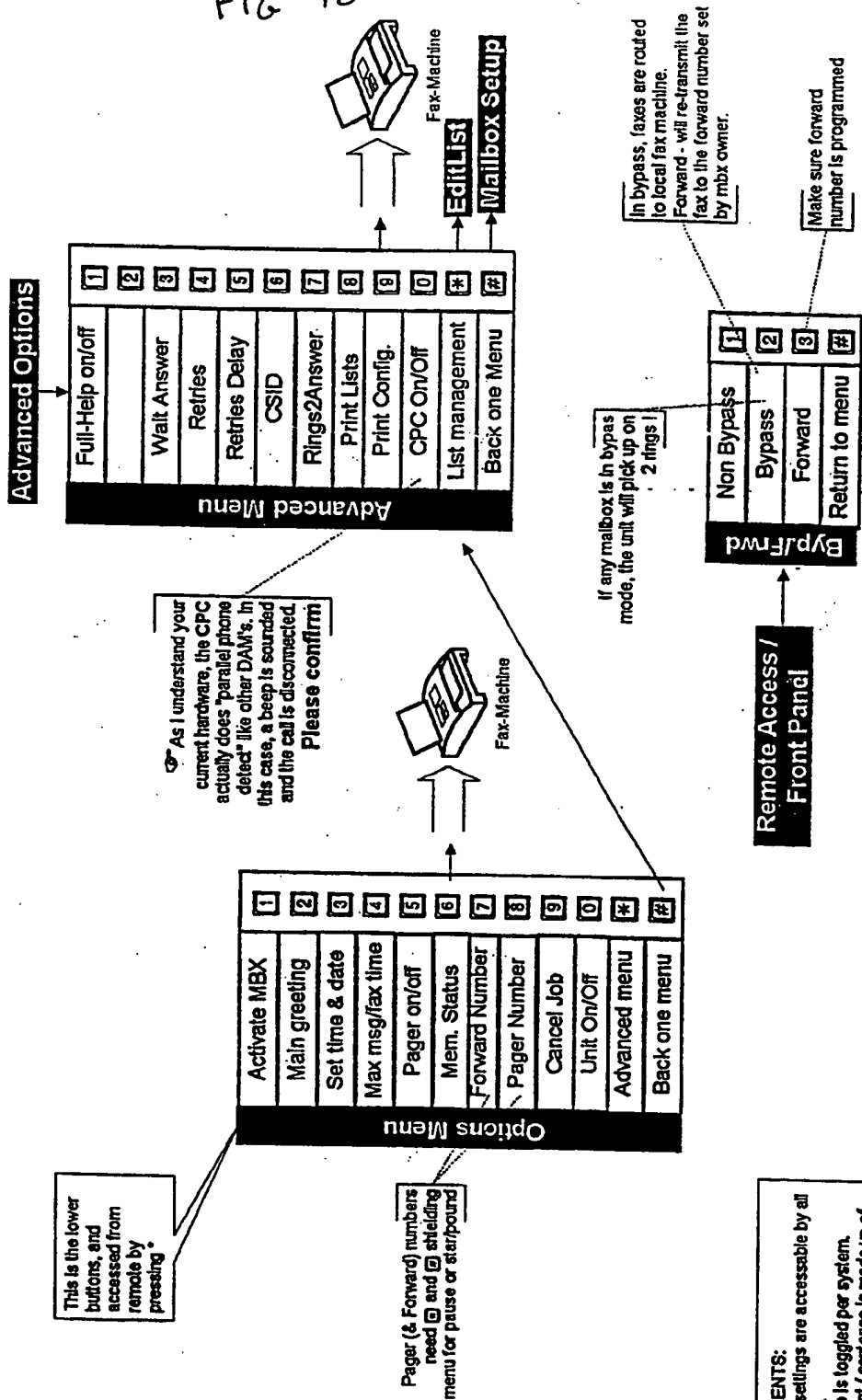


Fig 13

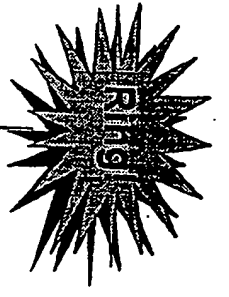
Owner Settings
(FaxFRIDAY Edition,
Ver. 1.0)



This is the lower buttons, and accessed from remote by pressing *

Pager (& Forward) numbers need * and * shielding menu for pause or star/pound

COMMENTS:
Global settings are accessible by all owners.
Full help is toggled per system.
A prompt / sentence is made up of distinct words.
Invalid options will not be played.



Caller Mode
(FaxFRIDAY Edition,
Ver. 1.0)

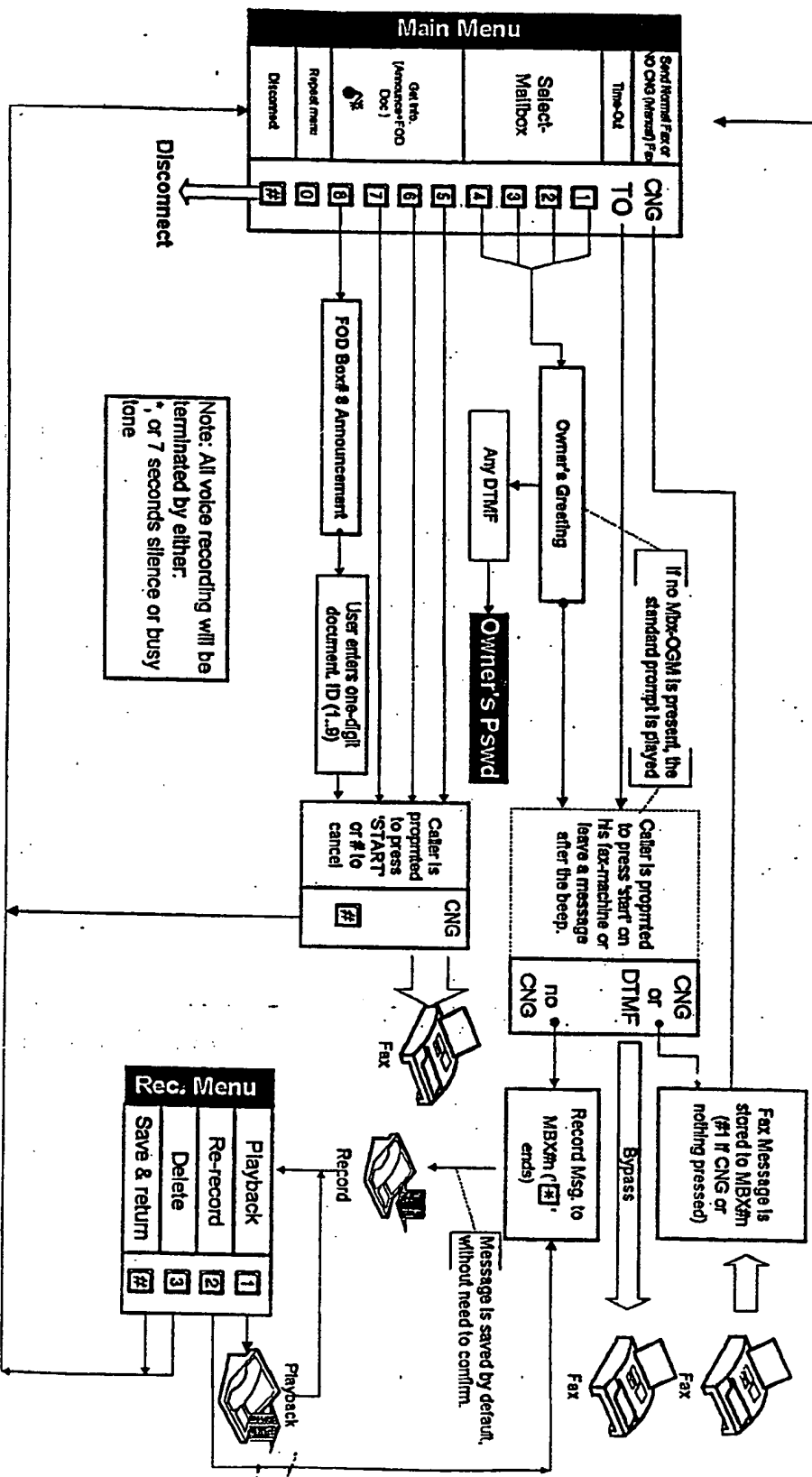


Fig. 14

Remark: In FOD boxes, if no Announcement has been recorded, unit skips to fax operation. If document code cannot be found, 'INVALID SELECTION' is announced.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/05574**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(5) : H04M 1/64, 1/65, 3/04, 3/42, 3/50, 5/04, 5/12

US CL : Please See Extra Sheet.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 379/67, 70, 88, 89, 210, 211, 212, 213, 214, 252, 372, 373, 374, 375, 377, 418

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A 5,159,626 (BAUM et al.) 27 October 1992, col.1,lns.6-67, col.5,lns.29-40, figure 1, and figure 2	1-2
X	US, A, 4,939,771 (BROWN et al.) 3 July 1990, col.1,ln.60-63, col.4,ln.18-54, col.5,ln.10-15, col.15,ln.60 to col.16,ln.4.	1-2
X	US, A, 4,916,726 (MORLEY, Jr. et al.) 10 April 1990, figure 2, figure 5, whole document.	2
A,P	US, A, 5,260,996 (DILLON et al.) 09 November 1993, whole document.	3
A	US, A, 4,239,935 (BOSIK et al.) 16 December 1980.	3



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:	*T	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be part of particular relevance	*X*	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y*	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L documents which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z*	document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means		
P document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

23 JULY 1994

Date of mailing of the international search report

05 OCT 1994

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/05574

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A,E	US, A, 5,321,596 (HURST) 14 June 1994	3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US94/05574

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Telephone Practice

- I. Claims 1-2 drawn to an apparatus for providing a telephone answering and voice messaging machine, classified in Class 379 subclass 67.
- II, claim 3 is drawn to a ring generator, classified in Class 379, subclass 375.

1. ☒ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US94/05574

A. CLASSIFICATION OF SUBJECT MATTER:

US CL :

379/67, 70, 88, 89, 210, 211, 212, 213, 214, 252, 372, 373, 374, 375, 377, 418